

**Wilfley**

---

**Centrifugal  
Slurry  
Pump**

**Operating  
Handbook**

---

**Model HD**



**WILFLEY**

## Table of Contents

---

Safety Precautions	2
General Installation	3
Operating and General Service Recommendations	4
Pump Assembly Instructions	6
Spare Parts Ordering	10
Parts List	10A
Pump Sectional View	11
Pump System Troubleshooting	12

For additional information about Wilfley Pumps call or write our office in Denver, or the representative in your area.

Please do not hesitate to contact us concerning any aspect of our pumps.

### **WILFLEY**

A. R. Wilfley and Sons, Inc.  
P.O. Box 2330  
Denver, Colorado 80201  
1-303-779-1777

Telex 054-543  
FAX # 303-779-1277

©A.R. Wilfley & Sons, Inc. 1986

## Safety Precautions

---

Throughout this manual, references are made concerning pump configurations corresponding to specific pump sizes. Detailed cutaways are provided for models to show general configurations.

### Special Service

Your Wilfley HD pumps may be returned to the factory, at any time, for complete overhaul and repair. Each pump is completely disassembled and worn or inoperative parts are replaced. All rebuilt pumps are subjected to the same testing procedures as newly constructed units.

For more information on rebuilding, contact A.R. Wilfley and Sons, 1-303-779-1777.

Telex 054-543

FAX # 303-779-1277

Like all machinery, centrifugal pumps can be dangerous if used improperly. Any of the listed misuses may result in a pump which does not function properly. A pump which does not function properly may be a hazard and could cause damage or injury.

For maximum safety and reliability, use only factory supplied parts and closely follow all maintenance and operating recommendations and instructions.

Do not change the pumping conditions or installation of a Wilfley pump without consulting A.R. Wilfley & Sons, Inc. first to ascertain if the pump is capable of handling the new conditions and/or fluid.

It is impossible to list all the conceivable misuses of a centrifugal pump. Therefore, the following list is not meant to be complete and is provided only as a guide and as example of the types of misuse which can damage a pump and cause injury. The list will also give a good idea of the kinds of misuses which will void any warranties, if any.

1. Do not run a pump with the discharge valve closed.
2. Do not run a pump in the reverse direction.
3. Do not start a pump which is "windmilling" in the reverse direction due to fluid flowing back down the discharge pipe and into the suction pipe.
4. Do not continue to operate a pump when there are indications that something is rubbing, binding or knocking.
5. Do not continue to run a pump which gives an indication of overheating.
6. Do not operate the pump with the belt or coupling guard removed. Make sure the guard fits snugly around the belts or couplings so there are no openings.

7. Do not operate a pump that is vibrating, surging or making abnormal noise.

8. Do not work on a pump unless the drive system is locked out and the pump is disconnected from the drive system.

9. Do not connect the pump to the drive system without first checking to see that the drive system is running in the correct direction.

10. Do not rely on the factory's alignment of pump and the drive system.

11. Do not put a cold liquid in a hot pump or a hot liquid in a cold pump.

12. Do not hit a pump with any object.

13. Do not use worn or faulty parts.

14. Do not stick hands, arms, legs or any other object into the discharge or intake or any other opening of the pump.

15. Do not weld attachments to the pump.

16. Do not apply external heat to the pump.

17. Do not lift the pump by the lifting lugs on the Long Cylinder. These lugs are to lift the Long Cylinder only. To lift the entire pump attach a chain or sling to the case bolts and the shaft.

18. Do not examine a pump without using proper eye and face protection.

19. Some materials deteriorate with time. If your pump has been out of service for more than 3 months, please contact A.R. Wilfley & Sons, Inc. for information concerning its suitability for service.

20. Do not operate this pump with solution temperature over 200°F.

## General Installation

### Inspection Upon Arrival

Your pump has been carefully inspected and tested prior to shipment to assure that it meets your requirements. Please inspect the pump upon arrival for any damage which may have occurred during shipment. Report any damage immediately to the carrier. Leave all shipping covers attached to the pump unit until it's ready for installation. If installation is to be delayed more than 15 days, the pump shaft should be rotated by hand once a week to lubricate the bearings and prevent rusting.

### Choosing Pump Location

The following recommendations may be helpful when choosing the best location for your pump.

a. Locate the pump as close to the liquid source as practical so that the suction pipe is short and direct with a

minimum of elbows fittings and valves. Intake pipe must not slope upward toward the pump.

b. Place the pump in a location so that the unit is accessible for inspection during operation as well as for maintenance operations involving removal and disassembly.

c. Intake and discharge can be rotated to accommodate piping from the top or either side of the pump.

### Foundations

The foundation should be sufficiently substantial to absorb any vibration and to form a permanent support for the frame. This is important in maintaining the correct alignment of the direct connected unit. A concrete foundation on a solid base is satisfactory. Foundation bolts of the proper size should be embedded in the concrete located by the outline drawing.

### Alignment

It is necessary to align the pump and motor after the complete unit has been leveled on the foundation and after the foundation bolts have been tightened. Explicit directions for checking and aligning the pump components may be found in the Hydraulic Institute Standard.

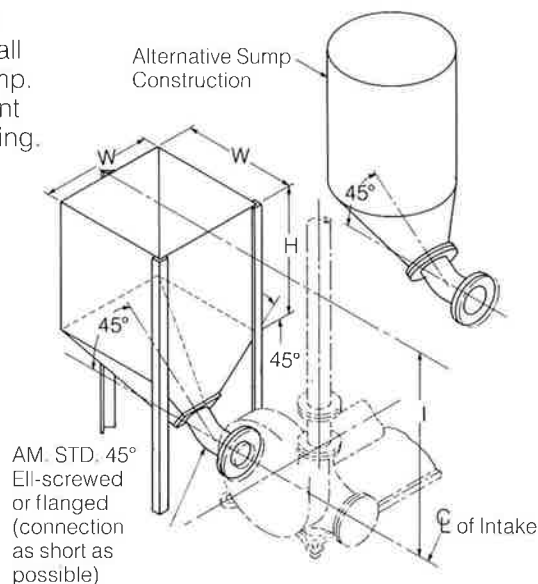
### Piping

Both suction and discharge pipes should be supported independently near the pump so that when the flange bolts are tightened no strain will be transmitted to the pipe casing. Expansion joints should be installed where large temperature variations are involved, with a pipe anchor used between pump and the expansion joint. Piping should have the proper valving so that the pump can be removed for maintenance.

### Intake Sump

It is desirable to feed the Wilfley pump by means of an intake sump or feed box placed as close to the pump as possible. Recommended sump sizes are given below. When the feed to the pump is increased or decreased, the material in the intake sump simply seeks a higher or lower level, respectively. Hopper bottom sumps are much more satisfactory than flat bottom sumps. A sloping pipe from the intake sump into the pump is particularly desirable when handling materials that settle quickly,

such as concentrates and coarse sands, or when the quantity is small for the size of intake pipe and pump. Long intake pipes require sufficient velocity in the pipe to prevent setting.



### Sump Dimensions

Discharge Size	4"	6"	8"	10"
W—Inches	66	77	108	120
H—Inches	48	70	76	88
L—Inches	90	132	144	166



## Operating and General Servicing Recommendations

---

### Pre-starting Recommendations

Please perform the following operations before attempting to start the pump.

- a. Visually check all main and auxiliary piping to insure that all connections have been properly made.
- b. Check voltage, fuse, starter, amperage ratings and frequency on the motor nameplate against the electrical supply characteristics.
- c. Visually inspect all electrical connections to the motor and control circuit.

d. CHECK THE ROTATION OF THE MOTOR BY MOMENTARILY STARTING THE MOTOR WITH THE MOTOR DISCONNECTED FROM THE PUMP ASSEMBLY. DIRECTION OF ROTATION MUST BE AS SHOWN BY THE ARROW ON THE PUMP CASE AND THE DIRECTION OF ROTATION ARROW ON THE TOP OF THE LONG CYLINDER. STARTING OR RUNNING PUMP BACKWARDS WILL CAUSE DAMAGE TO INTERNAL PARTS.

- e. Visually inspect Oil Dip Stick to be sure sufficient oil is present to provide adequate lubrication of bearings.

### Starting

Before starting the pump, it is advisable to have the pump casing and suction line filled with liquid. However, because no rubbing components are contained in this pump such as seals or packing, no damage will result if started dry. It is normal to have the discharge valve closed momentarily when the pump is started since much less horsepower is required under these conditions.

**DO NOT OPERATE THE PUMP IN A DEAD-HEADED (NO-FLOW) CONDITION.**

Heat can build up when a pump is "dead-headed". Temperatures must not exceed 200°F. High temperatures may cause extensive damage to synthetic parts.

### Shutdown

Close the suction valve and discharge valve, then stop the pump.

### General Servicing

Your Wilfley Model "HD" pump is designed to provide long and trouble-free service with a minimum of maintenance. It is recommended that the pump be inspected at regular intervals and it is also suggested that a service record be kept for the pump.

### Motor

Please refer to the manufacturer's motor manual for recommended service instructions. It is recommended that the motor be well ventilated when in operation.

### Pump Storage

If the pump is inoperative for a long period of time, it is recommended that the pump be flushed and drained to minimize corrosion. It is also advisable to drain the lines and case if there is a possibility of freezing. Please take the necessary precautions to minimize corrosion and periodically rotate the shaft to insure bearing lubrication.

## Periodic Servicing

The following table contains recommended service checks which should be performed on a periodic basis.

	After First Runup	Every Week	Every 2 Months
Flow, pressure and temperature (a)	●	●	
Gaskets	●		●
Visual (b)	●	●	
Noise/vibration	●	●	
Lubrication (c)	●		●

### a. Flow, Pressure and Temperature:

All flow and pressure gauges should be monitored to insure that the pump is operating within specified limits. Bearing temperatures should not exceed 200°F.

### b. Visual

Periodic visual inspection should be made of the pump and its installation. This following items should be secure and in good order:

1. All mounting supports and attaching points.
2. All external nuts, bolts and fittings.
3. All suction and discharge piping.

### c. Lubrication

The oil level in the Long Cylinder should not exceed the top line or fall below the bottom line of the Dip Stick.

Oil should be periodically checked to be sure lubricant is clean and present in sufficient quantities to provide adequate lubrication.

The "Oil viscosities and temperature ranges for ball bearing lubrication" table below will specify proper lubricant for your application.

### Oil Viscosities and Temperature Ranges for Ball Bearing Lubrication

Oil Temperature Range, Degrees F.	Viscosity
- 40 to + 100	70 to 80 SSU*
- 10 to + 100	80 to 100 SSU*
+ 30 to + 150	SAE 10
+ 30 to + 200	SAE 30
+ 50 to + 300	SAE 60

\*At 100 deg. F.

#### Note:

The Oil Fill Hole is next to the Dip Stick. The oil level on the Dip Stick can be observed through the Fill Hole during filling. This helps prevent overfilling.

## General

The section views for each type of Model "HD" pump shows the parts in their proper relationship and should be used as guides for disassembly and reassembly. Disassemble only to the extent necessary to repair.

## Inspection

Visually inspect all metal and plastic parts for cracks, fractures, burrs, scoring, excessive wear or other visually detectable faults. Check seals and gaskets for cuts, tears, deterioration and loss of resilience. Replace as required.

## Parts Handling and Cleaning

Always use proper tools for the job. Wash all metallic parts with solvent. Do not allow parts to remain in solvent for an extended period of time. Protect each part from contamination. If parts are not to be reinstalled in a short time, protect them from rust and corrosion.

## Special Disassembly Instructions

Case shell liner bolts must be secure before the case is removed from the pump. Bearings should not be removed from the shaft unless replacement is certain. BEARING CLEANLINESS IS A MUST.

## Oil Capacities

(Approximate).

Pump	Oil Capacity
6x4	4 quarts
8x4	5½ quarts
8x6	5½ quarts
10x6	10½ quarts
10x8	10½ quarts
12x8	11½ quarts
12x10	11½ quarts
14x10	13 quarts

# Pump Assembly Instructions

## I. Long Cylinder Assembly

### Inspection

#### a. Shaft (Item 15):

The Shaft should not be bent and should be free of corrosion. The Shaft should be clean and the threads should be in good condition. There should be no damage or scoring from oil seals.

#### b. Bearings (Item 14 & 18)

Bearing cleanliness is extremely important. Keep Bearings covered in a clean area until they are to be assembled on the Shaft. Before assembly slowly rotate and check for a smooth action. There should be no points of drag, hangup or looseness or ability to wiggle or cock.

#### c. Bearing Caps (Item 19 & 21)

Bearing Cap sealing faces and inner bores should be clean and free of burrs. Bearing Cap O-Rings and Oil Seals should be free from nicks and tears.

### Assembly

Install Bearings on the Shaft. Bearings may be pressed on or installed with the assistance of a bearing heater. When Bearings have been properly seated on the Shaft, secure with Bearing Locknut and Lockwasher. Bend one of the prongs on the Lockwasher into a slot on the Locknut in order to keep it in place. Check Bearings for free rotation and be sure that they are firmly locked into place on the Shaft.

Place the Shaft and Bearings in the bottom half of the Long Cylinder, be sure that the Long Cylinder is clean and free of corrosion. Push the Shaft as far forward in the Long Cylinder as possible and be sure that the Bearings seat correctly. Coat the Gasket flange surface of the lower half of the Long Cylinder with a liquid gasket material. Be sure the liquid gasket is applied evenly over the entire surface. Place the top half of the Long Cylinder in position, then install the taper pins to seat properly. Securely fasten the two halves of the Long Cylinder together with bolts, nuts and lockwashers.

Press the Oil Seals into the front and Rear Bearing Caps. Oil Seals should be flush with the outer face of the Bearing Cap. (See Diagram #1)

### Note:

The open slot of the Seal should be away from the Bearings. This is to provide greater protection against material entering the Long Cylinder and possibly contaminating the Bearings.

When oil seals need replacement, replace with single lip high pressure seals.

Lightly lubricate the Bearing Cap O-Ring, and place it in the groove on the Bearing Cap. Lubricate the Shaft so that the Oil Seals will slide freely and not be damaged during assembly. Slide the Bearing Caps onto the Shaft and bolt onto the Long Cylinder.

The word "top" cast into the Bearing Cap should be at the top of the Long Cylinder. This insures that the oil will circulate properly within the bearing cavity.

Evenly tighten Bearing Caps with bolts, nuts and washers.

Install Oil Fill Cap, Dipstick and Oil Drain Plug.

Place the metal inspection cover over the opening in the Front Bearing Cap.

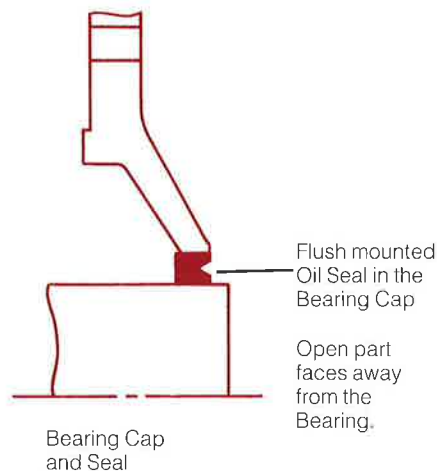


Diagram 1

## II. Frame

### Inspection

#### a. Frame (Item 5):

Long Cylinder mounting slides should be clean to promote proper seating of the Long Cylinder.

#### b. Bracket (Item 26):

Bracket feet and bores must be clean and free of corrosion.

#### c. Intake Chamber (Item 6):

Be sure Intake Chamber is not plugged and that it is free of obstructions.

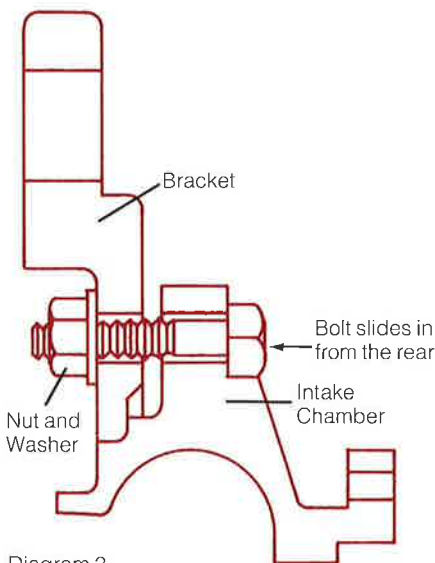
Machined surfaces should be clean and free of corrosion.

### Assembly

Attach the Bracket on the Frame. Be sure that the feet seat properly onto the Frame. Securely tighten the bracket with bolts, nuts and washers.

Attach the Drain and Vent Plugs to the Intake Chamber. Be sure that these plugs are secure.

Seat the Intake Chamber into the Bracket and attach with the appropriate bolts. These bolts slide in from the rear of the Intake Chamber through the Bracket (See Diagram #2) and the nut is placed on the inside of the Bracket.



Intake Chamber may be rotated 180° so that the slurry can enter on either side or from the top.

Place the Gland Ring on the back of the Intake Chamber. Do not tighten bolts, packing will be added when the pump assembly is completed.

Place the Long Cylinder assembly onto the Frame. Be sure that the feet of this assembly are clean so that it seats properly and will slide on the Frame. Attach the 4 bolts to the feet of the Long Cylinder in the slots on the Frame then slide the Long Cylinder as far forward as it will go.

## III. Expeller and Seal Assembly

### Inspection

#### a. Check Valve Sleeve (Item 17):

Be sure the Check Valve Sleeve is clean and free of burrs. The inner bore should be smooth so that it slides over the shaft easily. The outside face (See Diagram #3) is the sealing surface and it should be clean and smooth to promote proper sealing of the Check Valve Diaphragm. O-Ring groove must be clean, free of corrosion.

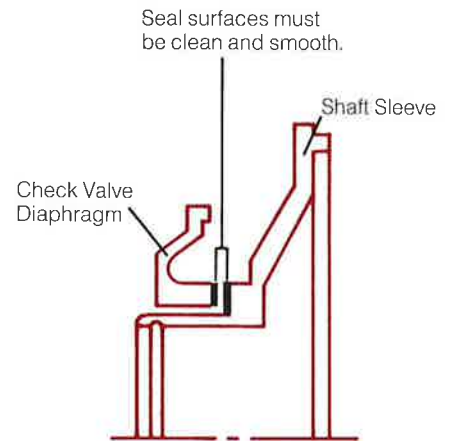


Diagram 3

b. Check Valve Diaphragm (Item 12): Check Valve Diaphragm should be clean and free of any tears, rips or imperfections. Sealing surfaces should be smooth. (See Diagram #3) and the entire diaphragm should be flexible to promote proper sealing.

#### c. Expeller (Item 4):

Vanes of the Expeller should show very little wear. Parts should be clean and free of corrosion.



## Assembly

A notch has been cut into the Shaft to provide a seat for the shaft sleeve set screw. Turn the Shaft so that the notch is on top. Coat the part of the Shaft where the shaft sleeve seats with an antiseizing compound. Place the Shaft Sleeve O-Ring in the groove on the inner bore of the Shaft Sleeve. Seat the Shaft Sleeve on the Shaft and tighten with the proper set screw. Make sure that the set screws seat firmly on the flat notch in the Shaft, and the shaft sleeve is against the shaft shoulder. (See Diagram #4)

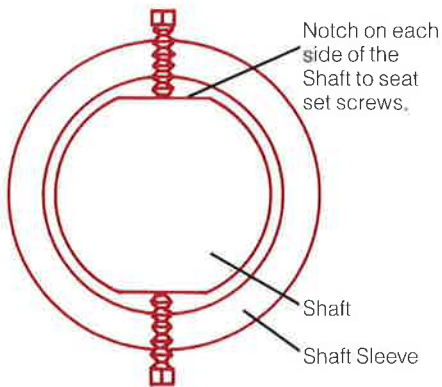


Diagram 4

Place the Die Ring Holder over the shaft so that it is nearly flush with the face of the Front Bearing Cap.

Place the Check Valve Diaphragm on the Die Ring Holder. Make sure that it seats properly in the grooves in the Die Ring Holder. (See Diagram #5)

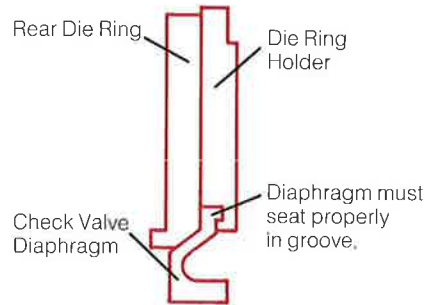


Diagram 5

Place the Rear Die Ring over the Shaft and seat on the Front Bearing Cap. Secure with 2 flathead bolts, nuts and neoprene washers.

### Note:

The holes to secure the Rear Die Ring are slightly off center on the top and bottom of the Front Bearing Cap. (See Diagram #6) The neoprene washer should have the metal side facing the nut.

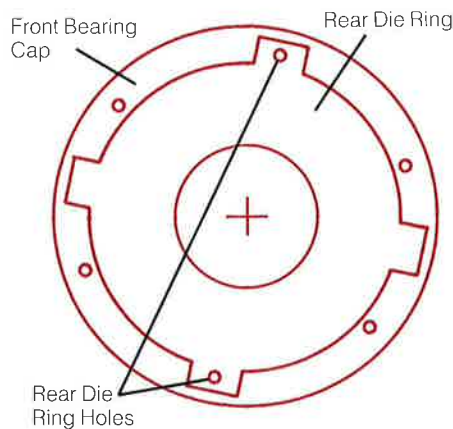


Diagram 6

Coat the Shaft with an antiseize compound out to the thread relief. Slide the Expeller onto the Shaft with the vanes facing the bearings. Spin the Expeller to make sure that it does not rub on the Rear Die Ring. If rubbing is detected, loosen bolts and center the Rear Die Ring.

Place the Front Die Ring over the Shaft and secure it to the Front Bearing Cap, bolts, nuts and neoprene washers. When the Die Ring has been fastened to the Front Bearing Cap, do not completely tighten. Turn the Expeller to make sure that it does not rub on the Front Die Ring. If rubbing is detected, loosen bolts and center the Front Die Ring. When the Front Die Ring is secure be sure the expeller turns freely.

## IV. Final Assembly

### Inspection

#### a. Runner (Item 2):

Be sure that the Runner vanes are clear and unplugged. Check for wear on the Runner. Be sure the babbitt in the bore of the Runner is clean and smooth.

#### b. Runner Bolt (Item 2A):

Threads of the Runner Bolt should be clean and in good condition.

#### c. Case (Item 1 & 1K):

Inspect the Case Liner and Case Shell for excessive or abnormal wear.

### Assembly

Place the Intake Chamber gasket on the lip of the Intake Chamber and the Follower Plate gasket on the Follower Plate. Set the Follower Plate into position in the Intake Chamber.

### Note

Use a clamp on smaller pumps or two bolts on larger pumps to hold the Follower Plate on the Intake Chamber so that it will not fall out of position. Place a bead of Silicone Sealant on the face of the Expeller which mates with the Runner.

Generously coat the threads of the Shaft with an antiseize compound and place the Runner onto the Shaft. Screw the Runner Bolt onto the Shaft until it touches the Runner. Match the square indentation on the Runner with the Runner Bolt, and pull the Runner back to set the bolt into the Runner. Block the end of the Shaft to keep it from turning, and turn the Runner so that the nut tightens the Runner securely onto the Shaft.

Adjust Draw Bolt Bracket until the Runner and the Follower Plate meet.

Place the Case Shell Gasket on the Case Shell. Attach the Case Liner to the bore of the Case Shell. Bolt the Case Liner and Case Shell together. \*Do not tighten the Case Liner bolts as they are used only to keep these pieces together during assembly. Hand tighten these bolts once the case assembly has been secured to the pump. Place the Crane Arm Pin into the Brackets and attach the Crane Arm. (6x8 and smaller only). Set the Case Assembly on the Crane Arm Hook. Place the Case Bolt in the slot behind the Intake Chamber. This bolt must be placed in first due to limited room, the other case bolts will be attached once the case is in place.

Swing the Case onto the Bracket and secure it with bolts, nuts and washers. Case Bolts must seat properly in the pockets on the rear of the Bracket. Before fully tightening the Case Bolts, be sure the flange of the Case Liner is level. Evenly tighten the Case Bolts so that the Case is secure.

Pull the Gland Ring from the Intake Chamber and rest it on the Long Cylinder. Place the gland ring packing around the Long Cylinder between the Intake Chamber and the Long Cylinder. Put the Gland Ring in place and securely tighten.

The Draw Bolt assembly is installed on the opposite side of the intake. Attach the Draw Bolt and secure with a nut to the Bracket. Install a nut and a washer on the Draw Bolt and attach the Draw Bolt bracket to the Long Cylinder. Install another nut and washer on the Draw Bolt. There should be a nut and washer on both sides of the Lobe of the Draw Bolt bracket.(See Diagram #7)

## V. Clearance Adjustment

Move the Long Cylinder assembly back with the Draw Bolt assembly until the Runner touches the Follower Plate. Move the Cylinder assembly forward again with the Draw Bolt assembly  $\frac{1}{16}$  inch. Turn the Shaft to be sure that there is no rubbing. Tighten the Long Cylinder to the Frame.

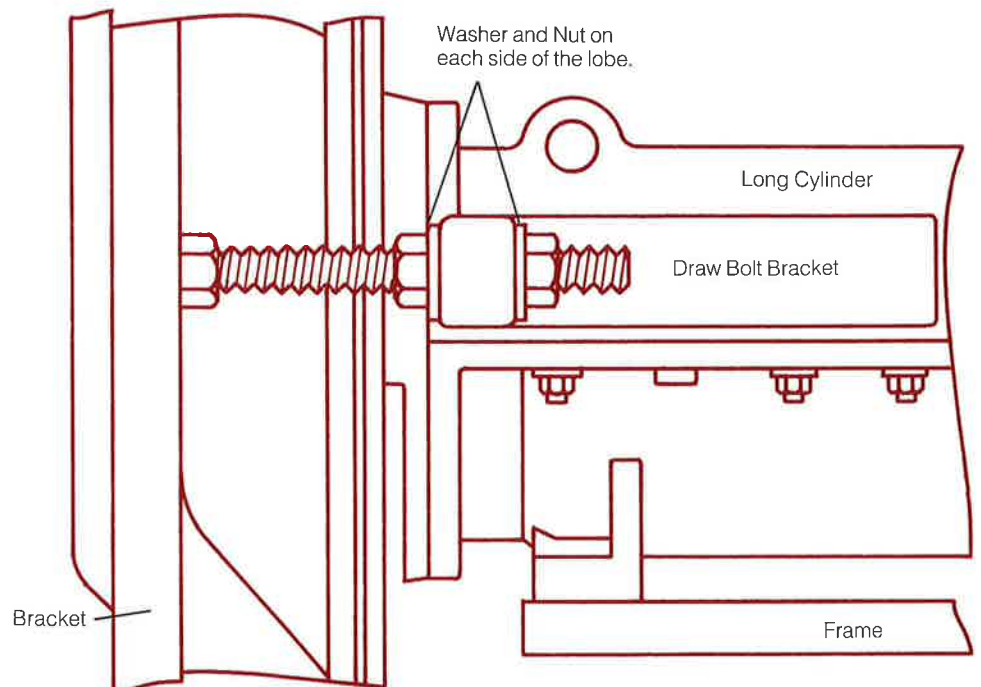


Diagram 7

## Spare Parts Ordering

---

PLEASE INCLUDE THE SERIAL NUMBER OF YOUR PUMP WHEN ORDERING SPARE PARTS. THE SERIAL NUMBER ALLOWS US TO DUPLICATE THE ORIGINAL CONFIGURATION AND MATERIALS OF YOUR PUMP.

### **#6000**

#### **Recommended Spare Parts Kits:**

Except for gaskets this kit contains the parts we recommend you have on hand to provide proper maintenance of your pump. Several gasket kits, numbers 6400 and 6450, should also be ordered. The spare parts kit is designed for one pump and the number of parts should be altered when ordering stock for two or more pumps. The quantity of spare parts stocked can be varied depending on the severity of your pumping conditions.

### **#6100**

#### **Shaft-Long Cylinder Assembly Kit:**

Bearings are pressed onto the shaft, locked in place and assembled in a complete long cylinder with bearing caps. This unit needs only to be filled to the proper level with oil and installed in the pump.

#### **Gasket Kits**

Gasket kits supply all the gaskets you will need when reassembling your pump. Several of these kits should be kept on hand.

### **#6400**

#### **Gasket Kit:**

(Long Cylinder Only)

### **#6450**

#### **Gasket Kit:**

(Wetted End Only)

The wetted end gasket kit contains gaskets that are in contact with the solution being pumped.

### **Special Service**

Your Wilfley Model HD Pumps may be returned to the factory at any time for complete overhaul and repair. Each pump is completely disassembled and worn or inoperable parts are replaced. All rebuilt pumps are subject to the same testing procedures as newly constructed units. Each pump is thoroughly inspected upon arrival. The tolerance and condition of each part is checked and only the parts which do not meet test requirements are replaced. We charge the standard price for our parts and a minimal assembly fee.

The utilization of this service provides you with almost instantaneous pump repair at an economical price. Units are overhauled and returned to you quickly.

Please contact A.R. Wilfley & Sons, Inc. or any of our representatives concerning our pumps or parts. You can be assured that we will do all within our power to ensure your complete satisfaction with Wilfley products.

For additional information and parts ordering contact A.R. Wilfley & Sons, Inc. / P.O. Box 2330 / Denver, Colorado 80201 / 1-303-779-1777.

Telex 054-543

FAX # 303-779-1277

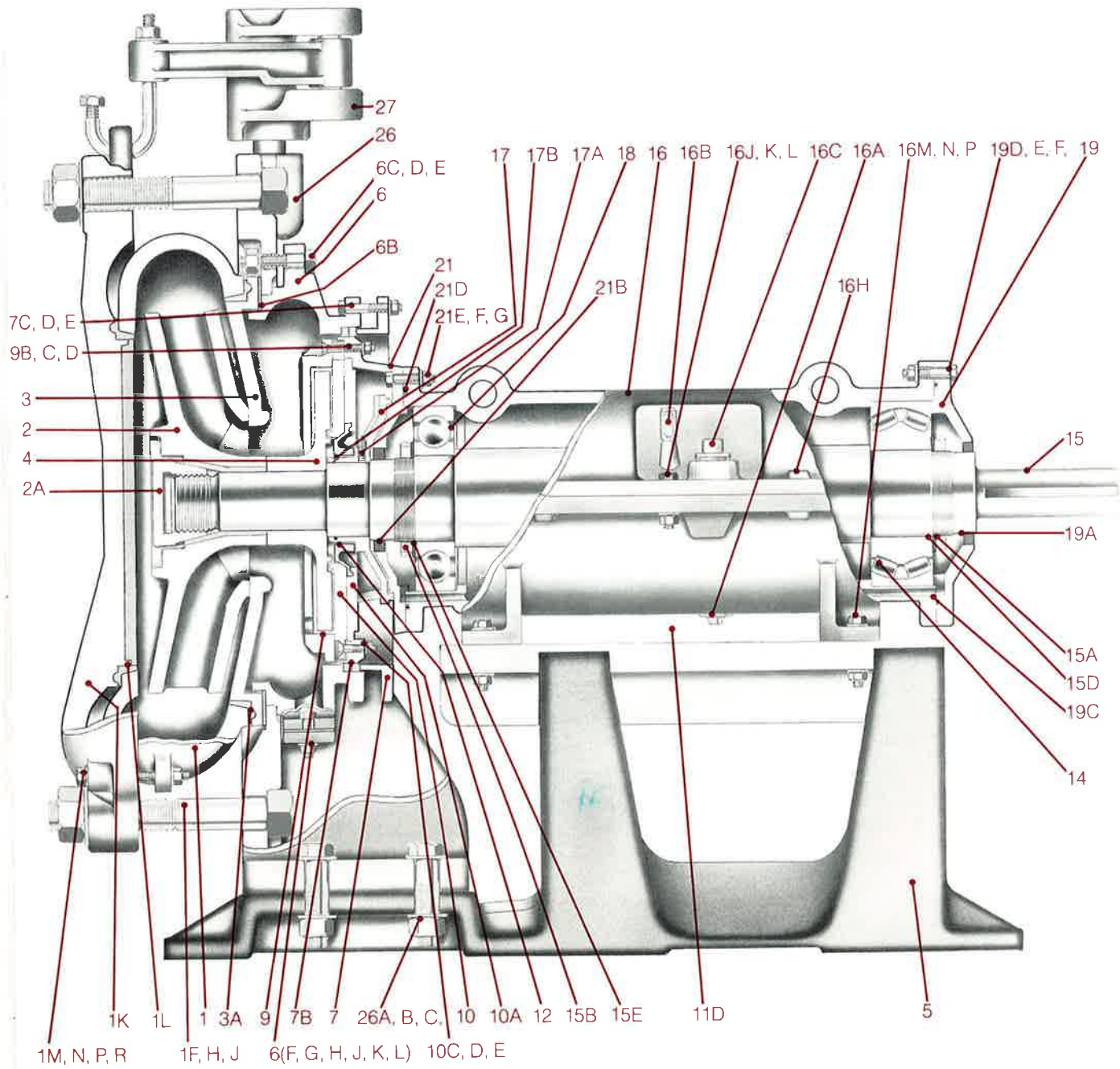
## Parts List and Recommended Spare Parts

Part Number	Number Required	#6000 Spare Parts Kit	#6100 Long Cylinder Assembly Kit	#6450 Wetted End Gasket Kit	#6400 Long Cylinder Gasket Kit	Description
1	1	1				Case Liner
1F, H, J	7					Case Bolt, Nut, Washer
1K	1					Case Shell
1L	1			1		Case Shell Gasket
1M, N, P, R	2					Case Shell Liner Bolts, Nut, Washer
2	1	1				Runner
2A	1					Runner Bolt
3	1	1				Follower Plate
3A	1			1		Follower Plate Gasket
3B, C, D	2					Follower Plate, Bolt, Nut, Washer (10 x 6 & larger only, not illustrated)
4	1	1				Expeller
5	1					Frame
6	1					Intake Chamber
6B	1			1		Intake Chamber Gasket
6C, D, E	4					Intake Chamber Bolt, Nut, Washer
6(F, G, H, J, K, L)	2					Intake Chamber Drain and Vent Plug Assemblies
7	1					Gland Ring
7B	*					Gland Ring Packing
7C, D, E	4					Gland Ring Bolt, Nut, Washer
9	1	1				Front Die Ring
9B, C, D	4			4 washers only		Front Die Ring Bolt, Nut, Washer
10	1	1				Rear Die Ring
10A	1					Rear Die Ring Holder
10C, D, E	2			2 washers only		Rear Die Ring Bolt, Nut, Washer
11D	1					Draw Bolt Bracket
12	1			1		Check Valve Diaphragm
14	1		1			Thrust Bearing (Ball or Spherical)
15	1		1			Shaft
15A	1		1			Rear Bearing Locknut
15B	1		1			Front Bearing Locknut
15D	1		1			Rear Bearing Lockwasher
15E	1		1			Front Bearing Lockwasher
16	1		1			Long Cylinder
16A	1		1			Long Cylinder Drain Plug
16B	1		1			Long Cylinder Oil Gauge Rod
16C	1		1			Long Cylinder Filler Plug
16H	4		4			Long Cylinder Assembly Pin
16J, K, L	*		*			Long Cylinder Assembly Bolt, Nut, Washer
16M, N, P	4					Long Cylinder Foot Bolt, Nut, Washer
17	1					Check Valve Sleeve
17A	2					Check Valve Sleeve Setscrews
17B	1					Check Valve Sleeve O-Ring
18	1		1			Front Radial Bearing
19	1		1			Rear Bearing Cap
19A	1		1		1	Rear Bearing Cap Oil Seal
19C	1		1		1	Rear Bearing Cap O-Ring
19D, E, F,	8		8 each			Rear Bearing Cap Bolt, Nut, Washer
21	1		1			Front Bearing Cap
21B	1		1		1	Front Bearing Cap Oil Seal
21D	1		1		1	Front Bearing Cap O-Ring
21E, F, G	8		8 each			Front Bearing Cap Bolt, Nut, Washer
21H	1					Front Bearing Cap Inspection Cover (not illustrated)
26	1					Bracket
26A, B, C,	4					Bracket Hold Down Bolt, Nut, Washer
27	1					Crane Assembly (8 x 6 and smaller only)

\*Number of parts varies with pump sizes



# Model HD





## Pump System Troubleshooting

Problem		Test	Test Results
No Flow or Low Flow.	<b>1</b>	Remove belts, rotate motor shaft by hand.	Shaft rotates freely. Shaft won't turn, or rubbing noise.
	<b>2</b>	Rotate pump shaft by hand.	Shaft rotates freely. Pump shaft won't turn.
	<b>3</b>	Start motor, check direction of rotation	Rotation correct. Rotation incorrect.
	<b>4</b>	Check pump shaft speed.	Pump speed correct. Pump speed incorrect.
	<b>5</b>	If pump gearbox or V-Belt driven—check motor speed.	Motor speed correct. Motor speed incorrect.
	<b>6</b>	Install pressure gauges at pipe inlet and discharge-pump not running.	Inlet pressure correct. Inlet pressure low or missing.
	<b>7</b>	Start pump and motor—check inlet pressure.	Inlet pressure correct. No inlet pressure.  Low inlet pressure.
	<b>8</b>	Check discharge pressure and compare with head-flow curve.	Pressure at pump correct. Pressure higher than normal. Pressure lower than normal.
	<b>9</b>	Check flow instrumentation vs. physical Measurement.	Measurements do not correspond.

Indicates	Action To Take	Notes
Motor malfunction.	Proceed to number 2. Repair or replace motor.	
Pump malfunction.	Proceed to number 3. Check adjustment of runner and follower plate gap. (see page 9) If gap is adjusted correctly disassemble pump to determine malfunction.	
Motor wiring reversed.	Proceed to number 4. Correct motor electrical connections.	
	Proceed to number 6. Proceed to number 5.	
Sheaves or gear ratio wrong. Wrong motor or low voltage.	Correct speed ratio. Correct as required.	
Inlet valve closed or blocked.	Proceed to number 7. Open valve or free blockage.	
Unit cavitating or not primed.  Inlet line restricted or air leaks in inlet piping, excessive vapors (low NPSH), foaming of fluid.	Proceed to number 8. Bleed pump case. Check valves and piping.  Use defoamer, eliminate air leaks or install vent pipe for froth. Correct HPSH problems.	
Faulty instrumentation. Discharge valve or piping blocked. Excessive runner clearance, runner or follower plate damage. (Could indicate excessive pump flow and delivery. Proceed to number 9.)	Proceed to number 9. Correct blockage.  Adjust runner to follower plate gap (see page 9). Repair worn or damaged parts.	
Instrumentation Error.	Check valving, instrumentation and piping.	

# Pump System Troubleshooting

Problem	Test	Test Results	
Noise and/or Vibration	<b>1</b>	Visually check for loose or missing screws or bolts from coupling or tie-down points.	Bolts and screws secure. Loose or missing bolts.
	<b>2</b>	Inspect belts and sheave balance and alignment.	Belts and sheaves O.K. Belt and sheave out of balance or alignment.
	<b>3</b>	Rotate pump by hand.	Pump free and clear. Scraping, clunking or other unusual noise heard or pump won't turn free and easily.
	<b>4</b>	With unit running, monitor type and location of noise. Use stethoscope or screwdriver held against pump and motor housing over bearings.	Grinding, scraping, rubbing noise heard from pump only. Scraping or rubbing noise heard from motor only. Thumping or clicking noise or excessive vibration.
	<b>5</b>	Push and pull pump and motor shafts in both radial and axial directions.	No shaft movement observed. Shaft wiggles or moves.
	<b>6</b>	With belts removed turn on motor and listen for noise.	Motor quiet. Noisy.

Indicates	Action To Take	Notes
Improper or incomplete assembly.	Proceed to number 2. Replace and tighten bolts.	
Poor alignment and balance.	Proceed to number 3. Adjust or replace as needed.	
	Proceed to number 4. Proceed to number 5.	
Runner rubbing on follower plate. Possibly motor fan blades loose or bent. Bearings malfunction.	Adjust runner to follower plate gap (see page 9). Consult motor manual. Proceed to number 5.	
Bearing O.K. Failed bearings.	Proceed to number 6. Replace bearings.	
Motor failure.	Recheck tests. Remove and replace.	

## Pump System Troubleshooting

Problem		Test	Test Results
Motor runs hot or throws breaker.	<b>1</b>	With motor and pump not running verify unit rotates freely without noise or drag by hand.	Shaft turns freely—no noise. Shaft drag or noise.
	<b>2</b>	Check breaker fuse size and motor nameplate rating.	Breaker fuse and motor rating correspond. Breaker fuse and motor do not correspond.
	<b>3</b>	With motor and pump running, check pump and motor speed.	Speed and motor direction O.K. Speed of pump wrong.
	<b>4</b>	Measure pump output flow rate and/or discharge pressure.	Flow and pressure correct. Flow too high (discharge pressure low).
	<b>5</b>	Measure motor amperage or HP.	Amperage (HP) O.K. Amperage (HP) too high.
	<b>6</b>	Measure motor voltage at motor and breaker.	Motor voltage O.K. Motor voltage low.
	<b>7</b>	Check motor fan cooling and air flow.	Good air flow, cool temperature. No air flow.



Indicates	Action To Take	Notes
Mechanical problem.	Proceed to number 2. Go to section on noise and vibration #1.	
Correct motor and fuse.	Proceed to number 3.	
Incorrect fuse.	Install proper fuse.	
Correct motor and frequency. Incorrect motor or frequency.	Proceed to number 4. Correct motor.	
Improper valving or system upset.	Proceed to number 5. Correct system problems.	
Mechanical failure of pump or motor.	Proceed to number 6. Go to section on noise and vibration #1.	
Incorrect voltage.	Proceed to number 7. Correct voltage.	
Motor problem. Motor fan difficulty or shroud blocked.	Consult Motor Manual. Improve air flow, consult Motor Manual.	

## Pump System Troubleshooting

### Problem

### Test

### Test Results

Whenever leakage is encountered, before removing pump, visually determine when the leakage is occurring (while pump is running or when pump is at full stop). Once you have determined when the pump is leaking, refer to guide below.

Leakage  
(normal running)

# 1

Visually determine exact leakage point.

Leakage from diaphragm area.

Leakage from case or gasket area.

Leakage  
(pump at complete stop)

# 2

Visually determine exact leakage point.

Leakage is from diaphragm area.

Leakage is from case or gasket area.

---

---

**Indicates****Action To Take****Notes**

---

Pump inlet pressure exceeds  
expeller capacity.

Check inlet pressure.

Gland ring loose

Tighten gland ring or replace packing.

Excessive expeller or die ring wear.

Disassemble pump and check expeller  
and front and rear die rings for wear.  
Expeller vanes should not be clogged  
or caked with material. Rear die ring  
face should be free of wear. Front  
die ring lip should be free of wear.

Damaged seal surface, gasket failure  
or loose bolts.

Check tightness of case bolts. See  
that the case plate fits tightly and  
is in good condition. If leakage  
continues, disassemble pump and  
inspect gasket sealing surfaces and  
gasket. Replace worn or damaged  
parts.

Problem with diaphragm or shaft  
sleeve.

Thoroughly wash diaphragm area  
with clean water. By spraying the  
diaphragm with a hose, this can be  
accomplished without disassembling  
the pump. If leakage persists, dis-  
assemble pump and replace worn  
diaphragm or shaft sleeve.

Gland ring loose.

Tighten gland ring or replace packing.

Damaged seal surface, gasket failure  
or loose bolts.

Check tightness of case bolts. See  
that the case plate fits tightly and  
is in good condition. If leakage  
continues, disassemble pump and  
inspect gasket sealing surfaces and  
gasket. Replace worn or damaged  
parts.